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INDEPENDENT PUBLIC SERVICE

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January 26, 2001

Jim Loock, Chief Electric Engineer
Public Service Commission
610 N. Whitney Way
P.O. Box 7854
Madison, WI 53707-7854

RE: In the Matter of Filing Plans for Appropriate Inspection and
Maintenance, PSC Rule 113.0607.

Dear Mr. Loock:

Enclosed for filing are 3 copies of Black Earth's Preventative Maintenance Plan detailing inspection maintenance schedules, condition rating criteria, corrective action schedules, record keeping procedures and report filing schedules as documented in this rule.

Very truly yours,



Robert A Harper
Electrical Superintendent

Enclosures

RECEIVED

JAN 29 2001

Electric Division

PREVENTATIVE MAINTENANCE PLAN

2001 JAN 30 A 3 13

BLACK EARTH UTILITY

FILING DEADLINE

FEBRUARY 1, 2001

January 26, 2001

Robert A Harper

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This plan was prepared by the MEUW work group for PSC Rule 113.0607 for use by the 82 municipal electric utilities in Wisconsin and endorsed by PSC staff as meeting the requirements of Rule PSC 113.0607.

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I. Preventative Maintenance Plan

The PSC 113.0607 rule reads;

Appropriate inspection and maintenance: system reliability.

(1) PREVENTATIVE MAINTENANCE PLAN. Each utility or other person subject to this chapter, including persons who own electric generating facilities in this state who provide service to utilities with contracts of five years or more, shall develop and have in place its own preventative maintenance plan. This section is applicable to electric generating facilities as set forth at s. 194.491(5)(a)(1), Stats. Each plan shall include, among other things, appropriate inspection, maintenance and replacement cycles where applicable for overhead and underground distribution plant, transmission, generation¹, and substation facilities.

(2) CONTENTS OF THE PLAN. (a) *Performance standard.* The Preventative Maintenance Plan shall be designed to ensure high quality, safe, and reliable service, considering: cost, geography, weather, applicable codes, national electric industry practices, sound engineering judgment and experience.

1 *PSC staff interpretation is that generation applies to individual generators equal to or greater than 50 MW.*

II. Inspection Schedule and Methods:

The purpose of this plan is to maintain or improve the electrical system reliability with the objective of increased municipal loyalty and satisfaction from our constituents. The goals are to meet and exceed the schedules established in this plan.

Exception reporting (inspected equipment not in good condition) will be the method of documentation on all inspection forms.

The scope of this plan is traditional and uses proven maintenance techniques. Unique operating and maintenance philosophies have not been considered. Also, manufacturer defects will be dealt with as they are communicated to this utility.

| SCHEDULE: | MONTHLY | ANNUAL | EVERY 5 YEARS |
|--|----------|----------|------------------|
| Transmission ($\geq 69\text{Kv}$ and above) | | X | X |
| Substations | X | X | |
| Distribution (OH & UG) | | | X |

The inspection of Distribution facilities will be by individual substation circuits on a 5-year cycle such that the entire system will be inspected every 5 years. Inspector instructions for inspecting all facilities and forms are included with the plan.

METHODS: Five criteria groups will be used to complete the inspection of all facilities.

1. IR – infrared thermography used to find poor electrical connections and/or oil flow problems in equipment.
2. RFI - Radio Frequency Interference, a byproduct of loose hardware and connections, is checked using an AM radio receiver.
3. SI – structural integrity of all supporting hardware including poles, crossarms, insulators, structures, bases, foundations, buildings, etc.
4. Clearance – refers to proper spacing of conductors from objects, trees and other utility cables.
5. EC – equipment condition on non-structural components such as circuit breakers, transformers, regulators, reclosers, relays, batteries, capacitors, etc.

III. Condition Rating Criteria:

This criterion, as listed below, establishes the condition of a facility and also determines the repair schedule to correct deficiencies.

- 0) Good condition
- 1) Good condition but aging
- 2) Non-critical maintenance required – normally repair within 12 months
- 3) Priority maintenance required – normally repair within 90 days
- 4) Urgent maintenance required – report immediately to the utility and repair normally within 1 week

IV. Corrective Action Schedule

The rating criteria as listed above determine the corrective action schedule.

V. Record Keeping

All inspection forms and records will be retained for a minimum of 10 years. The inspection form contains all of the required critical information i.e. inspection dates, condition rating, schedule for repair and date of repair completion.

VI. Reporting Requirements

A report and summary of this plan's progress will be submitted every two years with the first report due to the Commission by February 1, 2003. The report will consist of a letter documenting the percent of inspections achieved compared to the schedule and a description of maintenance achieved within the scheduled time allowance.

VII DISTRIBUTION – OVERHEAD INSPECTION GUIDE

STRUCTURE

- Pole Condition
- Pole Leaning
- Crossarm Condition
- Insulators, Deadend, Pin
- Excess Fill or Soil Removal
- Pole Steps
- Grounds Intact
- Ground Molding
- Down Guys
- Guy Markers
- Guy Bonding/Insulator
- Signage - Location Number, Warning Sign
- Customer Equipment
- Conductor
- Tie Wires
- U Guard/Conduit Condition

EQUIPMENT

- Transformers
 - ✓ Oil Leaks
 - ✓ Bushing Condition
 - ✓ Grounding/Bonding
- Capacitors
 - ✓ Fuses Blown
 - ✓ Bushing Condition
 - ✓ Oil Leaks
 - ✓ Tank Bulged
 - ✓ Switches, Oil, Vacuum
 - ✓ Control Conduit/Wiring
 - ✓ Grounding/Bonding
- Switches - GOAB, Inline, Disconnect
 - ✓ Insulator Condition
 - ✓ Operating Handle/Locks
 - ✓ Linkage
 - ✓ Grounding/Bonding
 - ✓ Switch Number
- Cutouts
 - ✓ Insulator Condition
 - ✓ Fuse Size Tag

VII DISTRIBUTION – OVERHEAD INSPECTION GUIDE (con't)

EQUIPMENT (CON'T)

- Arrestor
 - ✓ Insulator Condition
 - ✓ Connections
 - ✓ Ground Lead Disconnection
- Cable Terminators
 - ✓ Insulator Condition
 - ✓ Grounding/Bonding

CLEARANCES

- Ground Line
- Buildings, Bridges, Swimming Pool, Etc.
- Communications Facilities
- Fuel Tanks
- Other Electric Utilities
- Transmission Lines
- Over Streets, Roads, Alleys, Highways
- Tree Trimming
 - ✓ Clearance From Line
 - ✓ Vines on Poles
 - ✓ Danger Trees

INFRARED SCAN

- Main Three-Phase Feeders
- Priority Overhead Transformer Banks
 - ✓ Bushing Connectors Primary
 - ✓ Bushing Connectors Secondary
 - ✓ General Tank Heating
- Current & Voltage Transformers if Applicable

RFI CHECK

- OH system with AM radio as each circuit is inspected

Date _____ Inspected by _____ Sub _____ Ckt _____

| MAP AREA | STRUCTURE | EQUIPMENT | CLEARANCE | COMMENTS | Date Item Corrected | Corrected By |
|-------------------------|-------------------------|-----------|-----------|--|---------------------|--------------|
| LOCATION | Pole Condition/Leaning | | | Rating Criteria ----- 0) Good Condition 1) Good Condition but aging 2) Non-critical Maintenance Required 3) Priority Maintenance Required 4) Urgent Maintenance Required | | |
| | Crossarm Condition | | | | | |
| | Insulators, DE, Pin | | | | | |
| | Soil Conditions | | | | | |
| | Pole Steps | | | | | |
| | Grounds Intact, Molding | | | | | |
| | Down Guys and Markers | | | | | |
| | Guy Bond, Insulator | | | | | |
| | Signs, Loc#, Warning | | | | | |
| | Customer Equipment | | | | | |
| Conductor and Ties | | | | | | |
| U-Guard/Conduit Cond | | | | | | |
| RFI Check | | | | | | |
| Transformer | | | | | | |
| Switches | | | | | | |
| Cutouts | | | | | | |
| Arresters | | | | | | |
| Terminators | | | | | | |
| Street Light | | | | | | |
| Tree Trimming | | | | | | |
| Ground Line Clearances | | | | | | |
| Building Clearances | | | | | | |
| Streets, Roads, Alleys | | | | | | |
| Communication Clearance | | | | | | |

VIII DISTRIBUTION – UNDERGROUND INSPECTION GUIDE

STRUCTURAL (Exterior & Interior) Transformer, Primary Pedestal, Secondary Pedestal, Switchgear.

- Enclosure Condition
- Level/Leaning
- Security
- Grade/Accessibility (Shrubs, Customer Facilities, Fill/Excavation)
- Numbering
- Voids/Gaps
- Signage - Location Number, Warning Sign
- Pad/Vault Condition

EQUIPMENT

- Transformers
 - ✓ Oil Leaks
 - ✓ Bushing Condition
 - ✓ Grounding/Bonding
 - ✓ Elbows
 - ✓ Arrestors
 - ✓ Feed-Through
 - ✓ Cable Condition
 - ✓ Secondary Connections
- Primary Pedestals
 - ✓ Elbows
 - ✓ Junction Condition
 - ✓ Grounding/Bonding
- Secondary Pedestals
 - ✓ Secondary Connections
- Switches – URD Switchgear
 - ✓ Insulator Condition
 - ✓ Operating Handle Security
 - ✓ Linkage
 - ✓ Grounding/Bonding
 - ✓ Switch Number/Fuse Size & Number

INFRARED SCAN and RFI CHECK

- Main Three-Phase Feeders (Risers & Switchgear)
- Priority URD Transformer Banks
 - ✓ Bushing Connectors Primary
 - ✓ Bushing Connectors Secondary
 - ✓ General Tank Heating

UNDERGROUND DISTRIBUTION INSPECTION FORM Date _____ Inspected by _____ Sub _____ Circuit _____

| MAP AREA | STRUCTURE | | | | | | | | EQUIPMENT | | | | IR / RFI Scan | | COMMENTS | Date Item Corrected | Corrected By | |
|--------------------|---------------------|-----------------|----------|-----------------------|-----------|--------------|---------|-----------------------|---|---|----------------------------------|---|---|--|----------|---------------------|--------------|--|
| | Enclosure Condition | Level / Leaning | Security | Grade / Accessibility | Numbering | Voids / Gaps | Signage | Pad / Vault Condition | Transformers, Leaks, Bushings, Grounding, Bonds, Elbows, Arrestors, Cable cond, Connections | Primary Pedestals, Elbows, Grounding, Bonds, Junction cond. | Secondary Pedestals, Connections | Switches, Signage, Insulators, Security, Linkage, Ground, Bonds | Main Three Phase Feeders, Risers & Switchgear | Priority URD Transformers, Bushings and Tank heating | | | | |
| EQUIPMENT LOCATION | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
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IX SUBSTATION - MONTHLY INSPECTION GUIDE

TRANSFORMER MAIN TANK:

- Oil in bushings
- Bushing and arrestor porcelain
 - ✓ Cracks or chips
 - ✓ Rust or dirt
- Oil leaks
 - ✓ Main tank
 - ✓ Sample valves
 - ✓ Radiators
- Radiator bank
 - ✓ warm on top, cool at bottom
- Tank pressure
- Tank oil level
- Temperature gauge
- Cooling fans

TRANSFORMER LTC or VOLTAGE REGULATORS:

- Tank oil level
- Drag hand positions
- Cabinet light
- Operation count
- Tank pressure
- Cabinet heater
- Cabinet contamination

TRANSMISSION CIRCUIT BREAKERS:

- OPEN/CLOSED indicator
- CHARGED/DISCHARGED indicator
- Cabinet light
- Cabinet heater
- Operations counter
- Bushings and supports
 - ✓ Cracks or chips
 - ✓ Rust or dirt
- Line and load side disconnect switches
 - ✓ Properly labeled
 - ✓ Aligned properly
- Handles grounded
- Emergency trip button
- Air / Oil compressors
- Air / Oil pressure gauge
- Spring operated mechanism
- Oil level gauge
- Tank oil leaks
- Reset switch
- Cabinet contamination
- Vents clean
- Gas pressures for GCBs

IX SUBSTATION - MONTHLY INSPECTION GUIDE (con't)

FEEDER CIRCUIT BREAKERS / RECLOSERS

- OPEN/CLOSED indicator
- CHARGED/DISCHARGED indicator
- Cabinet light
- Cabinet heater
- Operations counter
- Bushings and supports
 - ✓ Cracks or chips
 - ✓ Rust or dirt
- Line and load side disconnect switches
 - ✓ Labeled properly
 - ✓ Aligned properly
 - ✓ Handles grounded
- Emergency trip button
- Oil level gauge
- Tank oil leaks
- Reset switch
- Cabinet contamination
- Vents clean
- Gas pressures for GCBs

HIGH AND LOW VOLTAGE BUSS WORK:

- Bushing, insulator, arrestor, and support insulators
 - ✓ Chips or cracks
 - ✓ Rust or dirt
- Bird nests
- Potential transformers bushings
 - ✓ Cracks or chips
 - ✓ Rust or dirt
- Cable terminators
 - ✓ Leaking fluid
 - ✓ Cracks or chips

MANUAL SWITCHES:

- Properly labeled
- Ground connections
- Positioning and alignment
- Bushing and support insulators
 - ✓ Cracks or chips
 - ✓ Rust or dirt

MOTOR OPERATED SWITCHES:

- OPEN/CLOSED indicator
- Properly labeled
- Cabinet heater
- Operations counter

IX SUBSTATION - MONTHLY INSPECTION GUIDE (con't)

CONTROL HOUSE/MISCELLANEOUS:

- Clock displays proper time
- AC/DC load center breakers
- Room temperature
- Rodents
- Panels labeled properly
- Panel lights
- Annunciator panel
- Panel meters
- SCADA system RTU
- SCADA alarms
- Position indicators agree
- Relay target information
- Emergency contact directory & dial tone for phone
- Safety Equipment

BATTERY:

- Liquid levels
- Proper float voltage on charger and battery
- Specific gravity in pilot cell
- Personal Protective Equipment
- Connection corrosion
- Leaking cells
- Dated solution in eyewash station

YARD AND FENCE:

- Fire extinguisher charged
- Fence ground connections
- Fence secured
- Security and emergency lights
- Site base and grade
- Standing water
- Warning signs

MONTHLY SUBSTATION INSPECTION FORM

INSPECTED BY: _____

DATE: _____

SUBSTATION: _____

TRANSFORMER MAIN TANK

RATING: 0 1 2 3 4 (Circle One)

| inspected | X | COMMENTS | DATE CORRECTED | CORRECTED BY |
|----------------------|---|----------|-------------------|-----------------|
| Oil in Bushings | | | | |
| Bushing and Arrestor | | | | |
| Oil Leaks | | | | |
| Main Tank | | | | |
| Sample Valves | | | | |
| Radiators | | | | |
| Radiator Bank | | | | |
| Tank Pressure | | | | |
| Tank Oil Level | | | | |
| Temperature Gauge | | | | |
| Cooling Fans | | | | |
| | | | | |
| | | | | |
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TRANSFORMER LTC or VOLTAGE REGULATORS

RATING: 0 1 2 3 4 (Circle One)

| | | | | |
|-----------------------|--|--|--|--|
| Tank Oil Level | | | | |
| Drag Hand Positions | | | | |
| Cabinet Light | | | | |
| Operation Count | | | | |
| Tank Pressure | | | | |
| Cabinet Heater | | | | |
| Cabinet Contamination | | | | |
| | | | | |
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MONTHLY SUBSTATION INSPECTION FORM

INSPECTED BY:

DATE:

SUBSTATION:

HIGH VOLTAGE CIRCUIT BREAKER /
CIRCUIT SWITCHER

RATING: 0 1 2 3 4 (Circle One)

| inspected | X | COMMENTS | DATE CORRECTED | CORRECTED BY |
|--|---|----------|-------------------|-----------------|
| OPEN/CLOSED Indicator | | | | |
| CHARGED/DISCHARGED Indicator | | | | |
| Cabinet Light | | | | |
| Cabinet Heater | | | | |
| Operations Counter | | | | |
| Bushings and Supports | | | | |
| Line and Load Side Disconnect Switches | | | | |
| Handles Grounded | | | | |
| Emergency Trip Button | | | | |
| Air Compressors - Air / Oil | | | | |
| Air Pressure Gauge - Air / Oil | | | | |
| Spring Operated Mechanism | | | | |
| Oil Level Gauge | | | | |
| Tank Oil Leaks | | | | |
| Reset Switch | | | | |
| Cabinet Contamination | | | | |
| Vents Clean | | | | |
| Gas Pressures for GCBs | | | | |
| | | | | |
| | | | | |
| | | | | |

MONTHLY SUBSTATION INSPECTION FORM

INSPECTED BY:

DATE:

SUBSTATION:

FEEDER CIRCUIT BREAKER / RECLOSER

RATING: 0 1 2 3 4 (Circle One)

[illegible]

MONTHLY SUBSTATION INSPECTION FORM

INSPECTED BY:

DATE:

SUBSTATION:

HIGH & LOW VOLTAGE BUSS WORK

RATING: 0 1 2 3 4 (Circle One)

| inspected | X | COMMENTS | DATE CORRECTED | CORRECTED BY |
|--|---|----------|----------------|--------------|
| Bushing, Insulator, Arrestor, and Supports | | | | |
| Bird Nests | | | | |
| Transformer Bushings | | | | |
| Cable Terminators | | | | |
| | | | | |
| | | | | |
| | | | | |

MANUAL SWITCHES

RATING: 0 1 2 3 4 (Circle One)

| | | | | |
|---------------------------|--|--|--|--|
| Properly Labeled | | | | |
| Ground Connections | | | | |
| Positioning and Alignment | | | | |
| Bushings and Supports | | | | |
| | | | | |
| | | | | |
| | | | | |

MOTOR OPERATED SWITCHES

RATING: 0 1 2 3 4 (Circle One)

| | | | | |
|-----------------------|--|--|--|--|
| OPEN/CLOSED Indicator | | | | |
| Proper Labeling | | | | |
| Cabinet Heater | | | | |
| Operations Counter | | | | |
| locking criteria | | | | |
| | | | | |
| | | | | |

MONTHLY SUBSTATION INSPECTION FORM

INSPECTED BY: _____

DATE: _____

SUBSTATION: _____

CONTROL HOUSE/MISCELLANEOUS

RATING: 0 1 2 3 4 (Circle One)

| inspected | X | COMMENTS | DATE CORRECTED | CORRECTED BY |
|---|---|----------|-------------------|-----------------|
| Clock Displays Proper Time | | | | |
| AC/DC Load Center Breakers | | | | |
| Room Temperature | | | | |
| Rodents | | | | |
| Panels Labeled Properly | | | | |
| Panel Lights | | | | |
| Annunciator Panel | | | | |
| Panel Meters | | | | |
| SCADA System RTU | | | | |
| SCADA Alarms | | | | |
| Position Indicators Agree | | | | |
| Relay Target Information | | | | |
| Emergency Contact Directory & Dialtone for Phone | | | | |
| Safety Equipment | | | | |

BATTERY

RATING: 0 1 2 3 4 (Circle One)

| | | | | |
|--|--|--|--|--|
| Liquid Levels | | | | |
| Proper Float Voltage on Charger & Battery | | | | |
| Specific Gravity in Pilot Cell | | | | |
| Personal Protective Equipment | | | | |
| Connection Corrosion | | | | |
| Leaking Cells | | | | |
| Dated Solution in Eyewash Station | | | | |
| | | | | |
| | | | | |

YARD & FENCE

RATING: 0 1 2 3 4 (Circle One)

| | | | | |
|-------------------------------|--|--|--|--|
| Fire Extinguisher Charged | | | | |
| Fence Ground Connections | | | | |
| Fence Secured | | | | |
| Security and Emergency Lights | | | | |
| Site Base and Grade | | | | |
| Standing Water | | | | |
| Warning Signs | | | | |

X Substation - Annual Inspection Guide

- Check equipment for level
- Check condition of concrete pads
- Perform oil and DGA analysis
- Battery
 - ✓ Intercell strap resistance
 - ✓ Individual cell voltages
 - ✓ Cell specific gravity
- Nameplate legible
- Equipment paint condition
- Proper equipment ID labels
- IR / RFI scans and checks

Date _____ Inspected by _____ Substation _____

MEUW - Preventative Maintenance Plan Format